

WHAT IS CLAIMED IS:

1. A tire having at least one component of a rubber composition comprised of, based upon 100 parts by weight of elastomer (phr),

5 (A) 100 phr of elastomers comprised of:

(1) about 30 to about 80 phr of a styrene/butadiene elastomer composite (SBR Composite) comprised of a styrene/butadiene copolymer elastomer (SBR-1) and a functionalized styrene/butadiene copolymer elastomer (SBR-2) which contains at least internal silicon atom, with associated pendent hydroxyl and/or alkoxy groups, as a part of the (SBR-2) elastomer chain to thereby divide said elastomer into at least two segments thereof (SBR-2A and SBR-2B) with the silicon atom of said silanol and/or siloxy group therebetween, wherein said SBR composite is thereby comprised of a polymodal molecular weight configuration comprised about 35 to about 55 weight percent thereof of said (SBR-1) having a number average molecular weight (Mn) in a range of about 200,000 to about 300,000 and, correspondingly, about 65 to about 35 weight percent thereof of said (SBR-2) having a number average molecular weight (Mn) in a range of about 400,000 to 550,000; wherein said elastomer contains from zero to a maximum of ten weight percent an additional styrene/butadiene elastomer (SBR-3) pendent from said silicon atom having an number average molecular weight (Mn) of greater than 550,000, alternatively between 550,000 and about 650,000 and styrene content and Tg values within the ranges of said SBR-1 and SBR-1; and

20 (2) about 20 to about 70 phr of at least one additional diene-based elastomer; and

25 (B) about 35 to about 100 phr of particulate reinforcement comprised of:

(1) about 35 to about 85 phr of aggregates of precipitated silica comprised of a plurality of individual elementary silica particles, wherein said silica particles contain hydroxyl groups thereon and wherein a portion of said silica particles contain geminal hydroxyl in a ratio of geminal hydroxyl groups to hydroxyl groups of at least 0.2/1,

(2) from zero to about 15, phr of carbon black,

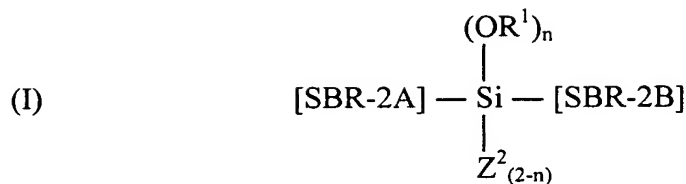
30 (C) a coupling agent having:

- (1) a moiety reactive with
- (a) said hydroxyl groups contained on the surface of said silica and silica treated carbon black; and
- (b) said silanol and/or siloxy groups of said (SBR-2) elastomer, and;
- (2) another moiety interactive with said additional diene-based elastomer and said SBR composite, and:
- (D) optionally, about 1 to about 10 phr of a starch/plasticizer composite comprised of starch and plasticizer therefor of a weight ratio in a range of about 0.5/1 to about 5/1, wherein said starch/plasticizer composite has a softening point in a range of from about 110°C to about 170°C, and;
- (E) optionally said coupling agent as a combination of a bis-(3-triethoxysilylpropyl) polysulfide having an average of from 2 to 2.5 connecting sulfur atoms in its polysulfidic bridge and a bis-(3-triethoxysilylpropyl) polysulfide having an average of from 3 to 4 connecting sulfur atoms in its polysulfidic bridge, wherein said polysulfide having an average of from 2 to 2.5 connecting sulfur atoms in its polysulfidic bridge is blended with said rubber composition in the absence of sulfur and sulfur vulcanization accelerator and wherein said polysulfide having an average of from 3 to 4 connecting sulfur atoms in its polysulfidic bridge is thereafter blended with said rubber composition in the presence of sulfur and at least one sulfur vulcanization accelerator.

2. The tire of claim 1 wherein said precipitated silica aggregates have:

- (A) a CTAB value according to ASTM D3765 test in a range of from about 80 to about 100, alternately about 80 to about 89, m²/g, and
- (B) a BET according to ISO 57/94/1, Annex D test in a range of about 155 to about 170 m²/g, and

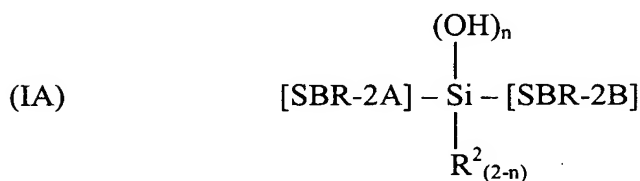
3. The tire of claim 1 wherein said (SBR-2) functionalized styrene/butadiene elastomer is of the general Formula (I):



wherein said [SBR-2A] and [SBR-2B] are individual segments each having a bound styrene content in a range of from about 25 to about 35 percent, a vinyl 1,2-content in a range of about 50 to about 70 percent based on the butadiene component of the respective styrene/butadiene (SBR-2) copolymer, a Tg in a range of about -15°C to about -30°C; wherein the silicon (Si) atom is attached to a butadiene moiety of the respective (SBR-2A) and (SBR-2B); R¹ is selected from selected from hydrogen, methyl, ethyl, propyl, butyl and phenyl groups; and Z² is selected from an additional SBR segment of said styrene content and said Tg, an alkyl radical containing from 1 to about 18 carbon atoms, or an aromatic radical containing from 6 to about 12 carbon atoms, and where n is a value of from 1 to 2.

4. The tire of claim 3 wherein R¹ is selected from hydrogen or an ethyl group and n is 2.

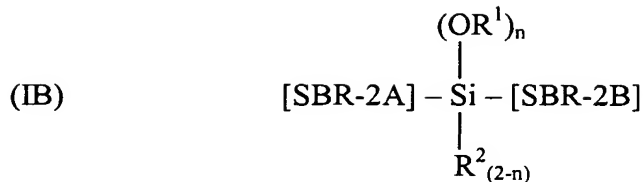
5. The tire of claim 1 wherein said (SBR-2) elastomer is represented as Formula (IA):



wherein R² is a radical selected from isopropyl, t-butyl, phenyl and tolyl radicals and n is a value ranging from zero to 2.

6. The tire of claim 5 wherein n is 2.

7. The tire of claim 1 wherein said (SBR-2) elastomer is represented as Formula (IB):

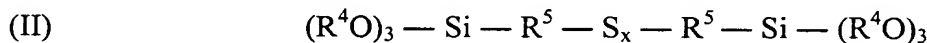


wherein R^1 is selected from methyl, ethyl, propyl, butyl, and phenyl radicals, and R^2 is a radical selected from isopropyl, t-butyl, phenyl and tolyl radicals and n is a value in a range of from zero to 2.

8. The tire according to claim 7 wherein R^1 is an ethyl group and n is 2.

9. The tire of claim 1 wherein said silica has an average total hydroxyl content in a range of from about 15 to about 20, hydroxyl groups per square nanometer of surface area of said silica particles, and

10. The tire of claim 1 wherein said coupling agent is an organosulfur silane of the general formula (II):



wherein R^4 is an alkyl radical selected from at least one of methyl and ethyl radicals, R^5 is an alkylene radical having from 1 to 18 carbon atoms, x is a value in a range of 2 to 8, with an average of from 2 to about 2.6 or from about 3.5 to about 4.

11. The tire of claim 1 wherein said precipitated silica is, prior to blending with said elastomer(s):

(A) pre-treated with an alkylsilane of the general Formula (III) prior to blending with said elastomer(s) and said coupling agent;

(B) pre-treated with said coupling agent of formula (II); pre-treated with an organomeraptosilane of formula (IV), or

(C) pre-treated with a combination of said alkylsilane of Formula (III) with and

(1) said coupling agent of the general Formula (II) and/or

(2) said organomeraptosilane of Formula (IV),

wherein said alkylsilane of the general Formula (III) is represented as:



5 wherein R^6 is an alkyl radical having from 1 to 18 carbon atoms, n is a value of from 1 through 3; X is selected from chlorine, methoxy and ethoxy radicals, and

 wherein said organomercaptosilane of the general Formula (IV) is represented as:

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 wherein X is a radical selected from chlorine, bromine and from alkyl radicals having from one to 16 carbon atoms; wherein R^7 is an alkyl radical
15 having from one through 4 carbon atoms; wherein R^8 is an alkylene radical having from one to 16 carbon atoms; and n is an average value of from zero through 3.

12. The tire of claim 11 wherein said tire is comprised of a component of a
20 rubber composition exclusive of any appreciable content of in situ formed alcohol.

13. The tire of claim 11 wherein, for said Formula (IV), X is chlorine and R^7 is selected from methyl and ethyl radicals and n is an average value of about 3.

25 14. The tire of claim 11 wherein R^7 is an ethylene radical, R^8 is a propylene radical and n is zero.

15. The tire of claim 11 wherein said alkylsilanes of formula (III) are selected from at least one of the group consisting of trichloromethylsilane,
30 dichlorodimethylsilane, chlorotrimethylsilane, trimethoxymethylsilane, dimethoxydimethylsilane, methoxytrimethylsilane, trimethoxypropylsilane, trimethoxyoctylsilane, trimethoxyhexadecylsilane, dimethoxydipropylsilane, triethoxymethylsilane and diethoxydimethylsilane.

16. The tire of claim 11 wherein said organomercaptosilanes of formula (IV) are selected from at least one of the group consisting of mercaptomethyltrimethoxysilane, mercaptoethyltrimethoxysilane, mercaptopropyltrimethoxysilane, mercaptomethyltriethoxysilane, mercaptoethyltripropoxysilane, mercaptopropyltriethoxysilane and mercaptopropyltrimethoxysilane.

17. The tire of claim 1 wherein said rubber composition contains from about 1 to about 10 phr of a starch/plasticizer composite comprised of starch and plasticizer therefor of a weight ratio in a range of about 0.5/1 to about 5/1, wherein said starch/plasticizer composite has a softening point in a range of from about 110°C to about 170°C.

18. The tire of claim 16 wherein starch/plasticizer composite is a composite of starch and synthetic plasticizer comprised of at least one of poly(ethylenevinyl alcohol) and cellulose acetate.

19. The tire of claim 1 wherein said coupling agent is a combination of a bis-(3-triethoxysilylpropyl) polysulfide having an average of from 2 to 2.5 connecting sulfur atoms in its polysulfidic bridge and a bis-(3-triethoxysilylpropyl) polysulfide having an average of from 3 to 4 connecting sulfur atoms in its polysulfidic bridge, wherein said polysulfide having an average of from 2 to 2.5 connecting sulfur atoms in its polysulfidic bridge is blended with said rubber composition in the absence of sulfur and sulfur vulcanization accelerator and wherein said polysulfide having an average of from 3 to 4 connecting sulfur atoms in its polysulfidic bridge is thereafter blended with said rubber composition in the presence of sulfur and at least one sulfur vulcanization accelerator.

20. The tire of claim 1 wherein said component is a tire tread.